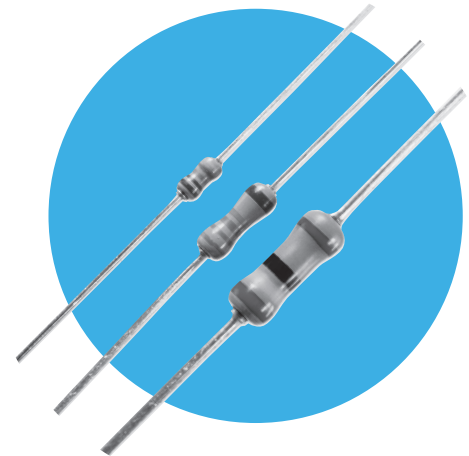


## Metal Film Resistors

### MFR Series

- Professional grade approved to BSCECC 40101-803 and 019
- Tolerances down to 0.5%
- Temperature coefficient down to 50ppm/°C
- Optional RoHS compliant or Lead bearing wire finishes



 All Pb-free parts comply with EU Directive 2011/65/EU (RoHS2)

### Electrical Data

		MFR3	MFR4	MFR5
Power rating at 70°C	watts	0.4	0.5	0.75
Resistance range	ohms	10R - 1M	1R0 - 1M	1R0 - 1M
Limiting element voltage	volts	200	350	350
TCR	ppm/°C	50	50	≤10:150 >10:100 <sup>1</sup>
Resistance tolerance	%	1	0.5, 1	0.5, 1

Note 1 - Tighter TCRs are available on professional grade, consult factory for details.

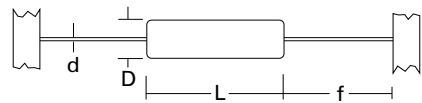
CECC 40101 - 019 Requirements		FZ	FX	EZ	EX
Power rating at 70°C	watts	0.25	0.25	0.5	0.5
Resistance range	ohms	1 to 1M	1 to 1M	10 to 1M0	10 to 1M
Limiting element voltage	volts	250	250	350	350
TCR	ppm/°C	100	250	100	250
Resistance tolerance	%	5.1 to 9.1 : 200	5.1 to 9.1 : 500	1	1

CECC 40101 - 803 Requirements		BC	BK	CC	CK
Power rating at 70°C	watts	0.125	0.125	0.25	0.25
Resistance range	ohms	10 to 1M	10 to 1M	10 to 1M	10 to 1M
Limiting element voltage	volts	200	200	250	250
TCR	ppm/°C	50	100	50	100
Resistance tolerance	%	0.5, 1	0.5, 1	0.5, 1	0.5, 1

These tables indicate the CECC specification requirements, and these are met or exceeded by the corresponding MFR series products.

Standard values		E24, E96 preferred		
Thermal impedance	°C/watt	150	140	112
Ambient temperature range	°C	-55 to 155		
Product grades available		commercial	commercial, professional	professional

### Physical Data

Dimensions (mm) & Weight (g)								
Type	L max	D max	F min	d nom	PCB mount centres	Min bend radius	Wt. nom	
MFR3 Commercial	3.7	2.0	22.4	0.45	7.6	0.5	0.1	
MFR4 Professional	6.2	2.5	21.0	0.6	10.2	0.6	0.3	
MFR4 Commercial	6.8	3.0	21.0	0.55	10.2	0.6	0.3	
MFR5 Professional	9.0	3.6	19.6	0.8	12.7	1.2	0.5	

#### General Note

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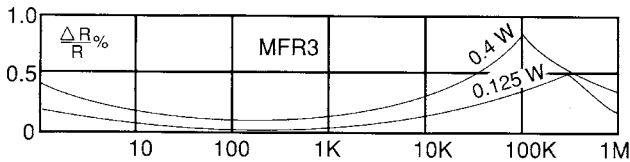
MFR Series

## Performance Data - Type MFR 3

	CECC 40101-019* Requirements	Actual Performance	
		Maximum	Typical
Load at commercial rating : 1000 hours at 70°C	$\Delta R$ %	0.8	See Graph 1
Load at CECC rating : 1000 hours at 70°C	$\Delta R$ %	0.5	See Graph 1
Shelf life : 12 months at room temperature	$\Delta R$ %	0.1	0.07
Derating	zero at 155°C		
Short term overload	$\Delta R$ %	0.25	0.03
Climatic	$\Delta R$ %	0.5	0.2
Climatic category	55/125/56		
Long term damp heat	$\Delta R$ %	0.5	0.3
Temperature rapid change	$\Delta R$ %	0.25	0.05
Resistance to solder heat	$\Delta R$ %	0.25	0.02
Vibration and bump	$\Delta R$ %	0.1	0.01
Noise. (in a decade of frequency)	$\mu V/V$	Not specified	0.07
Insulation resistance	ohms	>1G	>1G
Voltage proof	volts	350 min	400 min
Pulse handling		400 min	400 min

Data available upon request

\* CECC requirements are included for reference only; CECC release is not available on MFR3

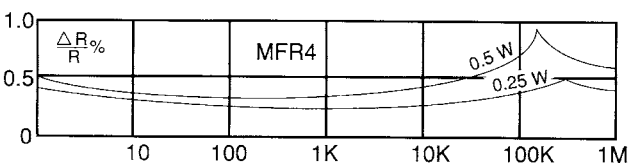


Graph 1 – Load for 1000 hours at 70°C: maximum changes

## Performance Data - Type MFR 4

	CECC 40101-019 Requirements	CECC 40101-803 Requirements	Actual Performance	
			Maximum	Typical
Load at commercial rating : 1000 hours at 70°C	$\Delta R$ %		0.8	See Graph 2
Load at CECC rating : 1000 hours at 70°C	$\Delta R$ %	2	0.5	See Graph 2
Shelf life : 12 months at room temperature	$\Delta R$ %	Not specified	0.1	0.07
Derating	zero at 155°C	zero at 155°C		
Short term overload	$\Delta R$ %	0.5	0.25	0.01
Climatic	$\Delta R$ %	2	0.5	0.2
Climatic category	55/125/56	55/125/56		
Long term damp heat	$\Delta R$ %	2	0.5	0.3
Temperature rapid change	$\Delta R$ %	0.5	0.25	0.04
Resistance to solder heat	$\Delta R$ %	0.5	0.25	0.07
Vibration and bump	$\Delta R$ %	0.5	0.25	0.01
Noise. (in a decade of frequency)	$\mu V/V$	Not Specified	0.1	0.1
Insulation resistance	ohms	>1G	>1G	>1G
Voltage proof	volts	500 min	400 min	500 min
Pulse handling			500 min	500 min

Data available upon request



Graph 2 – Load for 1000 hours at 70°C: maximum changes

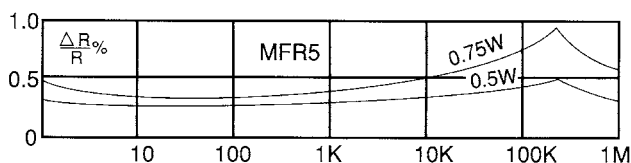
**General Note**

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MFR Series

## Performance Data - Type MFR 5

		CECC 40101-019 Requirements	CECC 40101-803 Requirements	Actual Performance	
				Maximum	Typical
Load at commercial rating :					
1000 hours at 70°C	ΔR %			0.9	See Graph 3
Load at CECC rating :					
1000 hours at 70°C	ΔR %	2	1	0.5	See Graph 3
Shelf life :					
12 months at room temperature	ΔR %	Not specified	Not Specified	0.1	0.07
Derating		zero at 155°C	zero at 155°C		
Short term overload	ΔR %	0.5	0.25	0.25	0.01
Climatic	ΔR %	2	1	0.5	0.2
Climatic category		55/125/56	55/125/56		
Long term damp heat	ΔR %	2	1	0.5	0.3
Temperature rapid change	ΔR %	0.5	0.25	0.25	0.04
Resistance to solder heat	ΔR %	0.5	0.25	0.25	0.07
Vibration and bump	ΔR %	0.5	0.25	0.1	0.01
Noise. (in a decade of frequency)	μV/V	Not Specified	Not Specified	0.1	0.07
Insulation resistance	ohms	>1G	>1G	>1G	>1G
Voltage proof	volts	700 min	500 min	700 min	700 min
Pulse handling		Data available upon request			

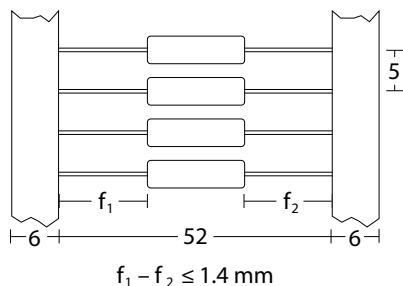


Graph 3 – Load for 1000 hours at 70°C: maximum changes

### Packaging

All MFR resistors are supplied tape packed ready for loading on to automatic sequencing and insertion machines. Component wires will not protrude beyond the outside edge of the tapes.

Alternative packaging available by request.



Lead Formed resistors can also be supplied. Standard options of Lancet, Radial and Goalpost forming are available.

### Construction

The resistance element is a precisely controlled thin film of metal alloy sputtered on to a high purity ceramic core, protected by a moisture-resistant, high dielectric strength coating applied so that terminations remain completely clear.

### Terminations

- Material** Hot tin dipped copper wire
- Strength** The terminations meet the requirements of IEC 68.2.21
- Solderability** The terminations meet the requirements of IEC 115-1, Clause 4.17.3.2

### Marking

0.5% and 1% tolerance resistors are colour coded with 5 bands. IEC 62 colours are used.

### Solvent Resistance

The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

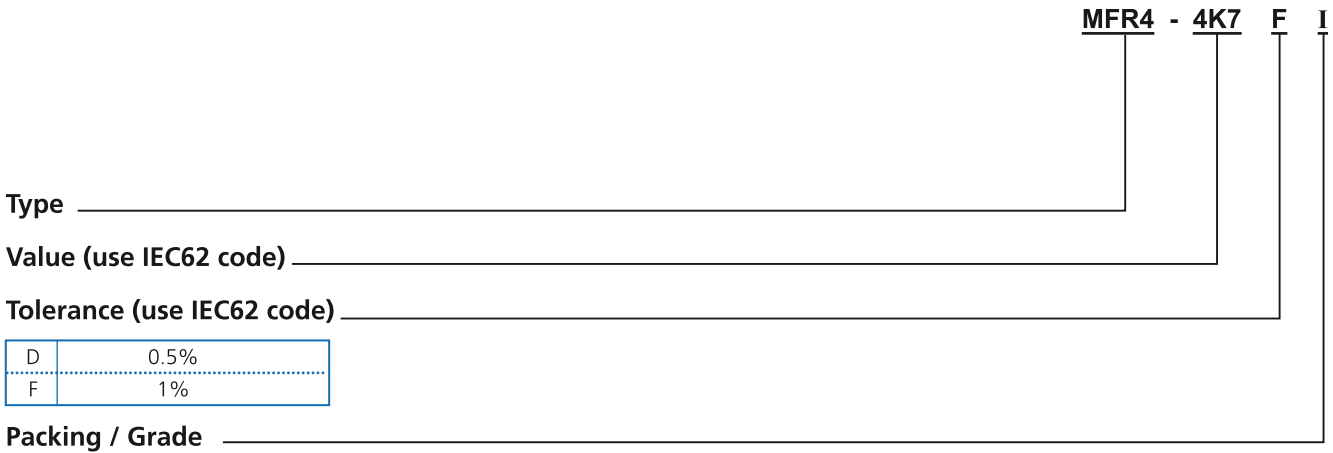
### General Note

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MFR Series

# Ordering Procedure

Example: Professional grade MFR4 at 4.7 kilohms and 1% tolerance in ammo pack box of 5000 pieces -



D	0.5%
F	1%

C	Ammo	MFR3, MFR4	5000/box	Commercial Grade
I		MFR4 MFR5	5000/box 2500/box	Professional Grade. CECC release is available within range indicated in Electrical Data.

For CECC released product state on order the CECC number and style.  
 Example: **MFR4-4K7FI CECC40101-019 FZ**

For SnPb finish (nominal 5% Pb) instead of Pb-free, replace the packing suffix with PB. Example: MFR4-4K7FPB

For SnPb finish (nominal 40% Pb) instead of Pb-free, replace the packing suffix with HL. Example: MFR4-4K7FHL

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